AMENDMENTS TO THE CLAIMS

1. (currently amended) An apparatus, comprising:

a wave guide switching element, comprising:

a wave guide substrate;

at least one planar wave guide attached to the wave guide substrate;

a liquid crystal material attached ~~to the a~~ to the wave guide substrate, the liquid crystal material in operative optical contact with the at least one planar wave guide, the liquid crystal material having a first and second state, wherein the index of refraction of the liquid crystal material in the first state matches the index of refraction of the at least one planar wave guide, and wherein the index of refraction of the liquid crystal material in the second state does not match the index of refraction of the at least one planar wave guide;

a means for applying an electric field across the liquid crystal material, wherein the liquid crystal material switches between the first state and the second state as the electric field is applied ;

wherein a beam of light in any polarization propagating in the wave guide is not reflected when the beam of light in any polarization reaches the liquid crystal material in the first state, and wherein the beam of light in any polarization is reflected when the liquid crystal material is in the second state.

2. (currently amended) The wave guide switching element according to Claim 1 wherein the first state of the ~~liquid crystal~~ liquid crystal material is an isotropic state and the second state of the liquid crystal material is a nematic state.

3. (currently amended) The wave guide switching element according to Claim 2 wherein the nematic state of the ~~liquid crystal~~ liquid crystal material is a field-forced nematic state.

4. (currently amended) The wave guide switching element according to Claim 1 wherein the first state of the liquid crystal material is a nematic state and the second state of the ~~liquid crystal~~ liquid crystal material is a nematic state.

5. (Original) The wave guide switching element according to Claim 1 wherein the liquid crystal material is contained inside a trench.

6. (Original) The wave guide switching element according to Claim 5 wherein the trench intersects the at least one planar wave guide.

7. (currently amended) The wave guide switching element according to Claim 5 wherein the trench intersects the at least one planar wave guide at an angle greater than the critical angle for total internal reflection when the liquid crystal material is in the second state.

8. (Original) The wave guide switching element according to Claim 1 wherein the means for applying an electric field across the liquid crystal material is a pair of electrodes.

9. (currently amended) ~~9~~ The wave guide switching element according to Claim 8 wherein the pair of electrodes is in electric connection with the liquid crystal material.

10. (Original) The wave guide switching element according to Claim 8 wherein the pair of electrodes is made from Indium-Tin-Oxide.

11. (Original) The wave guide switching element according to Claim 8 wherein the pair of electrodes is in-plane switching electrodes, the pair of the in-plane switching electrodes switches the liquid crystal material in plane.

12. (currently amended) The wave guide switching element according to Claim 11 wherein the in-plane switching electrodes are at the top of the ~~liquid crystal~~ liquid crystal material .

13. (Original) The wave guide switching element according to Claim 1 further comprising;

a cover substrate.

14. (Original) The wave guide switching element according to Claim 13 wherein the cover substrate has a first and second surface.

15. (Original) The wave guide switching element according to Claim 14 wherein the first surface of the cover substrate contacts the wave guide surface of the wave guide substrate.

16. (Original) The wave guide switching element according to Claim 15 wherein the first surface of the cover substrate contains a pair of in-plane switching electrodes.

17. (Original) The wave guide switching element according to Claim 1, further comprising;

an alignment layer, the alignment layer contacting the liquid crystal material.

18. (Original) The wave guide switching element according to Claim 17 wherein the alignment layer is for homogeneous alignment of the liquid crystal material.

19 (Original) The wave guide switching element according to Claim 17, wherein the alignment layer is for homeotropic alignment of the liquid crystal material.

20. (Original) The wave guide switching element according to Claim 1 wherein the beam of light is linearly polarized.

21. (Original) The wave guide switching element according to Claim 1 wherein the beam of light is circularly polarized.

22. (Original) The wave guide switching element according to Claim 1 wherein the beam of light. is randomly polarized.

23. (Original) The wave guide switching element according to Claim 1 wherein the beam of light is reflected via total internal reflection when the liquid crystal material is in the second state.

24. (Original) A method for producing a wave guide switching element, comprising;

a) providing a wave guide substrate;

b) attaching at least one planar wave guide to the wave guide substrate;

c) attaching a liquid crystal material to the wave guide substrate, the liquid crystal material in operative optical contact with the at least one planar wave guide, the liquid crystal material having a first and second state, wherein the index of refraction of the liquid crystal material in the first state matches the index of refraction of the at least one planar wave guide, and wherein the index of refraction of the liquid crystal material in the second state does not match the index of refraction of the at least one planar wave guide; and

d) providing a means for applying an electric field across the liquid crystal material, wherein the liquid crystal material switches between the first state and the second state as the electric field is applied,

wherein a beam of light in any polarization propagating in the wave guide is not reflected when the beam of light in any polarization reaches the liquid crystal material in the first state, and wherein the beam of light in any polarization is reflected when the liquid crystal material is in the second state.

25. (Original) The method of Claim 24 wherein step b) comprises;

providing the at least one planar wave guide with a curvature path for propagation of the beam of light.

26. (Original) The method of Claim 25 wherein the step of providing the at least one planar wave guide comprises;

providing the at least one planar wave guide with a curvature path for propagation of the beam of light in linear polarization.

27. (Original) The method of Claim 25 wherein the step of providing the at least one planar wave guide comprises;

providing the at least one planar wave guide with a curvature path for propagation of the beam of light in circular polarization.

28. (Original) The method of Claim 25 wherein the step of providing the at least one planar wave guide comprises;

providing the at least one planar wave guide with a curvature path for propagation of the beam of light in random polarization.

29. (Original) The method of claim 24, further comprising;

e) bonding a cover substrate having opposed first and second surfaces to the wave guide surface of the wave guide substrate, the first surface of the cover substrate contacting the wave guide surface of the wave guide substrate.

30. (Original) The method of claim 29, wherein step e) further comprises;

providing a pair of electrodes on the first surface of the cover substrate contacting the wave guide surface of the wave guide substrate.

31. (Original) The method of Claim 30, wherein the pair of electrodes is in-plane switching electrodes, the pair of in-plane switching electrodes switching the liquid crystal material in plane.

32. (Original) The method of claim 29, wherein step e) further comprises;

providing an alignment layer on the first surface of the cover substrate contacting the wave guide surface of the wave guide substrate.

33. (Original) The method of claim 24, wherein step c) comprises;

c1) providing a trench in the wave guide substrate, wherein the trench cuts the planar wave guide; then

c2) filling the trench with a liquid crystal material.

34. (Original) The method of claim 33, wherein step c1) further comprises;

providing the trench, wherein the trench intersects the at least one planar wave guide at an angle greater than the critical angle for total internal reflection, wherein the beam of light is reflected via total internal reflection when the liquid crystal material is in the second state.

35. (Original) The method of claim 33, wherein step c1) further comprises;

providing an alignment layer on walls of the trench.

36. (Original) The method of claim 33, wherein step c1) further comprises;

providing electrodes on walls of the trench.

37. (Original) The method of claim 24, wherein step d) comprises;

providing a pair of electrodes, wherein the pair of electrodes is in electrical connection with the liquid crystal material.

38. (Original) The method of Claim 37, wherein the pair of electrodes is in-plane switching electrodes, the pair of in-plane switching electrodes switching the liquid crystal material in plane.

1 39. (Original) The method of Claim 24, further comprising

f) providing an alignment layer on the waveguide substrate, the alignment layer in direct contact with the liquid crystal material.

40-150 (Canceled)